AMENDMENTS TO THE SPECIFICATION:

Please replace lines 1-2 (Title) of page 1 of the specification with following amended title:

An Apparatus and a Method of Detecting Hydrogen in an Object by Use of a Neutron

Please insert the following heading before line 4 of page 1:

Field of the Invention

Please insert the following heading before line 10 of page 1:

Background of the Invention

Please replace the paragraph starting at line 10 of page 1 of the specification with the following amended paragraph:

In general, the invention relates to a detection apparatus that is able to detect hydrogen (for instance for detecting an amount of water) in an object by use of a neutron source. A neutron source for this purpose presents the advantage [[ia]] in that neutrons are able to penetrate certain barriers. For instance, it is possible by this invention to estimate the amount of hydrogen, water and/or humidity in [[eg]], for example, insulation material arranged in [[ia]] a steel pipe. It can be used for checking whether and how much water/humidity there is present in the insulation material, which is important to know [[eg]] , for example, in connection with the assessment of the risk of corrosion, rust, etc. This may be performed without having to remove or cut in parts of the pipe/object or to separate the object/pipe or parts thereof.

Please replace the paragraph starting at line 22 of page 1 of the specification with the following amended paragraph:

A source of fast neutrons emits fast/energy-rich neutrons, [[ie]] therefore neutrons with high kinetic energy. In the present invention the known discovery is used to advantage that atomic nuclei (and in particular hydrogen) brake neutrons upon collision, a phenomenon typically referred to as elastic scattering/collision (whereby the velocity is reduced and the direction is changed for a collided neutron). This invention uses a detector device that detects relatively slow/energy-poor neutrons, the so-called thermal neutrons. After a neutron has been braked sufficiently, it can be detected by the detector device. The process of braking neutrons is typically designated `moderation` and a physical arranged for this a `moderator`. In order for a neutron to be detected, most often is has to collide several times with hydrogen atoms.

Please replace the paragraph starting at line 14 of page 2 of the specification with the following amended paragraph:

Patent specification GB A 1180450 discloses an arrangement for detecting humidity/hydrogen by use of a neutron source. The arrangement according to GB A 1180450 is shown schematically in FIG. 1 and comprises a fast-neutron source (103), a detector for thermal neutrons (102) and a hydrogen-containing neutron-braking and -reflecting/-scattering material ([[ie]] therefore moderator material) (104) for providing the back-scatter effect, wherein the detector (102) and the source (103) are arranged between this material (104) and the material/object (101) in which the humidity/water/hydrogen is to be detected.

Please replace the paragraph starting at line 30 of page 2 of the specification with the following amended paragraph:

Patent specification U.S. Pat. No. 3,707,631 relates to a system for non-destructive analysis of nuclear fuel, wherein a neutron source and a detector device are arranged to each their side of the sample. The source emits low-energy neutrons (<1 Mev), [[ie]] therefore not thermal, where a comparatively large moderator brakes the emitted neutrons to the effect that they can initiate a fission process that emits fast (>1 Mev) neutrons that are detected in an energy-selective scintillator. In this system, measurement is performed on fast neutrons and various measures must be taken to separate them from the (almost equally) fast neutrons from the source that have not been braked. A light guide is also mentioned, the primary function of which is to couple a number of very different scintillator geometries to the front of a standard photo-multiplier.

Please insert the following heading before line 22 of page 3 of the specification:

Summary of the Invention

Please replace the paragraph starting at line 25 of page 4 of the specification with the following amended paragraph:

Moreover, the dual function of the light-conductive unit, as it also provides a moderating effect, [[ie]] therefore contains hydrogen/moderator material for accomplishing the above-mentioned back-scatter effect, means that the apparatus according to the invention can be configured to be compact or at least not with dimensions that exceed the solutions that already comprise an auxiliary moderator.

Please replace the paragraph starting at line 1 of page 5 of the specification with the following amended paragraph:

The increased sensitivity means that the used neutron source need not be so powerful as to constitute a health risk and thus presupposes safety equipment for an operator or cumbersome handling thereof, while simultaneously a reliable, non-modifying/non-destructing detection is still provided, [[ie]] therefore without modification of a measurement object ([[eg]] , for example, sampling, cutting off a part of a pipe/object, taking it apart, etc). Moreover, smaller amounts of hydrogen can be detected compared to previously known solutions, due to the increased sensitivity.

Please replace the paragraph starting at line 4 of page 6 of the specification with the following amended paragraph:

For instance, said light-conductive unit may be configured essentially as a cone, where the top is cut way ([[ie]] therefore, a trapezoidal shape in 2D/in case of a section in the centre line of the cone as indicated [[eg]] , for example, in FIG. 2a).

Please insert the following heading before line 27 of page 8 of the specification:

Brief Description of the Drawings

Please insert the following heading before line 8 of page 9 of the specification:

Detailed Description of the Invention

Please replace the paragraph starting at line 8 of page 9 of the specification with the following amended paragraph:

FIG. 1 illustrates the prior art that uses the back-scatter principle for detecting hydrogen/water. Shown is a detection apparatus (100) for detecting hydrogen in an object (101). The detection apparatus (100) comprises a moderator containing hydrogen (104), a fast-neutron source (103), and a detector for thermal neutrons (102), wherein the neutron source (103) and the detector for thermal neutrons (102) are arranged between the moderator (104) and the object (101) by use of a detection apparatus (100). Moreover a detection face (109) for the detection apparatus (100) is shown schematically, [[ie]] therefore the face to be arranged adjoining the object (101) in which hydrogen is to be detected. Neutrons emitted by the source (103) will have largely all directions, and some of these neutrons will collide with the hydrogen both in the moderator (104) and with the hydrogen that is to be estimated in the object (101), whereby the neutrons will change direction and loose speed. A portion of the neutrons will be reflected against the detector by thermal neutrons 102, and when they have collided sufficiently many times they will be thermal ([[ie]] therefore they will typically have a kinetic energy within the range of about approximately 0.025 eV), whereby the detector will record them, and the amount of hydrogen in the object (101) can be detected. Some neutrons will be reflected both by the moderator (104) and the hydrogen in the object (101), while others will continue in other directions and/or be absorbed. Typically a neutron shall collide in average six times with a hydrogen atom in order to have an energy that the detector is able to detect (the neutron needs to reduce its energy level by approximately 6 to 8 orders of magnitude). The moderator (104) provides the effect that more neutrons with a suitable energy will be detected compared to a scenario in which it was only the hydrogen in the test object (101) that was primarily present for reducing the kinetic energy of the

neutrons. Hereby the sensitivity of the detection apparatus (100) is enhanced.

Please replace the paragraph starting at line 6 of page 10 of the specification with the following amended paragraph:

FIG. 2a schematically illustrates an embodiment of an apparatus according to the invention. Shown in the figure is a detection apparatus (100) that comprises a neutron source (103) and neutron-braking and -reflecting material (104'), [[ie]] therefore moderator material, [[eg]] for example, comprising hydrogen. The detection apparatus (100) has a detection face (109) that is intended for being directed towards or against an object (101) in which hydrogen is to be detected.

Please replace the paragraph starting at line 23 of page 10 of the specification with the following amended paragraph:

According to the invention the moderator material is a light-conductive unit or a light-conductive material (104'). In this manner the light-conductive unit (104) comprises both a moderating effect, [[ie]] therefore contains hydrogen/moderator material for obtaining the above-referenced back-scatter effect, and conducting/concentrating light from the light-emitting unit (102b) to the detection face (107) of the light-registering unit (102a), thereby further enhancing the performance/sensitivity, it being ensured that all nuclear events that bring about a flash of light will, with a much higher degree of certainty, be recorded by the light-registering unit (102a), thereby enabling that smaller amounts of hydrogen can be detected without an ensuing need to increase the strength of the neutron source.

Please replace the paragraph starting at line 23 of page 11 of the specification with the following amended paragraph:

For instance, the light-conductive unit can be configured essentially as a cone, where the top is cut away ([[ie]] therefore a trapezoidal form in 2D/in case of a section in the centre line of the cone, [[eg]] for example, as shown in the drawing).

Please replace the paragraph starting at line 27 of page 11 of the specification with the following amended paragraph:

The light-conductive unit/the light-conductive material (104') may [[eg]] , for example, be a light-guide (English term) comprising hydrogen and/or other moderator material. According to a preferred embodiment the light-guiding unit/the light conductive material (104') comprises Plexiglas.

Please replace the paragraph starting at line 9 of page 12 of the specification with the following amended paragraph:

According to one embodiment the light-emitting unit (102a) is a scintillator, which is a known standard unit that records a nuclear event and emits a flash of light when [[eg]] , for example a thermal neutron hits the scintillator (102b). In practice photons are released. One example of a scintillator (102b) includes glass enriched with the lithium isotope Li-6.

Please replace the paragraph starting at line 21 of page 12 of the specification with the following amended paragraph:

The electric circuit (105) receives electric pulses/signals from the light-registering unit/photo-multiplier (102a) and is thus able to record and/or process these signals depending on the relevant use, [[eg]] , for example, for estimating the amount of water/humidity/hydrogen in the

object (101) or for other applications. For instance, one or more electric output signals (108) from the electric circuit (105) can be used [[eg]] , for example, for a display/meter (not shown) that shows the estimated amount and/or other functions.

Please replace the paragraph starting at line 1 of page 13 of the specification with the following amended paragraph:

Preferably the light-registering unit/photo-multiplier (102a) and the light guide (104) will collide/adjoin each other at the detection face (107) of the light-registering unit/the photo-multiplier with an optical adaptor material there between, such as [[eg]] , for example, silicon grease, transparent silicon, joint filler, etc. to ensure as low an optic loss as possible by the transition.

Please replace the paragraph starting at line 7 of page 13 of the specification with the following amended paragraph:

The neutron source (103) may be [[eg]] , for example, an isotope-based neutron source.

Please replace the paragraph starting at line 20 of page 13 of the specification with the following amended paragraph:

Moreover the apparatus (100) may comprise a material disc, plate, piece, etc (not shown) arranged such that the neutron source (103) is between that and the detection face (109). Said disc, plate, piece, etc, must be of a material that possesses the property that it is good at reflecting neutrons without considerable loss of energy, [[eg]] , for example, iron or molybdenum. Moreover the apparatus (100) may comprise a ring, pipe, cylinder, etc, arranged such that it encircles the neutron source (103), whereby gamma radiation, if any, is removed that may otherwise give false hits upon reaction with the light-emitting unit (102b). This ring, pipe,

cylinder, etc, has to be of a material that possesses the property that, to a particular extent, it absorbs gamma radiation, [[eg]] , for example, lead or wolfram.

Please replace the paragraph starting at line 1 of page 14 of the specification with the following amended paragraph:

FIG. 2b schematically illustrates an alternative embodiment of an apparatus according to the invention. Shown in the figure is a detection apparatus (100) according to the invention comprising the same elements/units as shown in and explained in connection with FIG. 2a, but wherein they are arranged and optionally configured differently. More specifically the combined moderator and light-conductive unit (104") is configured such that it essentially conducts the light in parallel with the detection face (109) of the detection apparatus (100) to the light-registering unit (102a) (conversely to the embodiment shown in FIG. 2a, where the light is conducted essentially perpendicular to the detection face (109), thereby enabling a rather elongate configuration of the detection apparatus (100). The light-conductive unit (104") may be configured [[eg]] , for example, as shown in the figure, with a 2D profile as a triangle, wherein the incoming light from the light-emitting unit (102b) is reflected essentially perpendicular in relation to the incoming direction, [[ie]] therefore essentially in parallel with the detection face (109).

Please replace the paragraph starting at line 17 of page 14 of the specification with the following amended paragraph:

Alternatively the light-conductive unit (104") may be a batch of optical fibres/optical fibre cable that angles/turns/deflects the light sideways in relation to the primary angle of incidence, [[ie]]

therefore essentially in parallel with the detection face (109).

Please replace the paragraph starting at line 5 of page 15 of the specification with the following amended paragraph:

FIG. 2c schematically illustrates an alternative embodiment of an apparatus according to the invention. The shown embodiment corresponds to the one shown in FIG. 2a, but wherein the location of the neutron source (103) is changed. In the shown embodiment the neutron source (103) is arranged more towards the centre of the moderator (104'), [[ie]] therefore not in the face of the moderator (104") that adjoins the light-emitting unit (102b). Alternatively, the neutron source (103) can be arranged [[eg]] , for example, more towards the sides of the moderator (104'). The same modification of the position of the neutron source can also be performed in the embodiment shown in FIG. 2b or others.